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<p>(21) International Application Number: PCT/GB98/00122 (22) International Filing Date: 15 January 1998 (15.01.98) (30) Priority Data: 9700834.6 16 January 1997 (16.01.97) GB (71) Applicant (for all designated States except US): MARS U.K. LIMITED [GB/GB]; 3D Dundee Road, Slough, Berks SL1 4LG (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): GEE, Christopher, John [GB/GB]; 14 Snowdrop Grove, Wokingham, Berks RG41 5UP (GB). O'CONNOR, Stephen [GB/GB]; 84 Brook Road, Stoke Newington, London N16 7RU (GB). EDGERLEY, David, Anthony [GB/GB]; 14 Langbourne Avenue, London N6 6AL (GB). (74) Agent: COLGAN, Stephen, James; Carpmals &amp; Ransford, 43 Bloomsbury Square, London WC1A 2RA (GB).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p><b>Published</b> <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: WATER HEATER</p> <p>(57) Abstract</p> <p>A water heater has a reservoir (2) with a cold water supply inlet (4). A baffle (6) divides the reservoir (2) from a smaller heating chamber (8) containing a heating element (10) and a hot water outlet (14). The baffle has orificies (18, 20) for fluid communication between reservoir (2) and chamber (8). The arrangement enables discrete aliquots of hot water to be drawn off at irregular intervals quickly, such as may be employed in beverage dispensing machines. Also described is a novel valve (24) for use in the water heater.</p> <div data-bbox="909 1134 1364 1932"></div>		

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### WATER HEATER

This invention relates to water heaters, and particularly to hot water dispensers which are designed to dispense discrete aliquots of hot water at irregular intervals, such as in beverage dispensing machines.

5 One problem with beverage dispensing machines is to ensure that adequately hot water (for preparing a beverage) is available quickly on demand. Obviously one can provide a very large reservoir of hot water and/or a water heater of high thermal energy, but these are wasteful of space and uneconomic.

10 The present invention provides a hot water dispenser, as specified in the claims, which is particularly adapted for use in a beverage dispensing machine to provide discrete aliquots of hot water on demand quickly.

The invention also provides a novel valve as specified in the claims and which can be used in the hot water dispenser of the invention.

15 The invention employs a water reservoir to receive cold water, divided from a heating chamber to dispense hot water. The reservoir and chamber are divided by, for example, a baffle with one or more orifices for fluid communication. The baffle can be a wall in a container dividing the chamber from the reservoir, but this is not essential. The baffle could, for example, be in the form of an inverted cup within a larger container, so that the lower end of the chamber would be open to the reservoir of (colder) water.

20 Preferred features of the invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a cross-section of a hot water dispenser according to the invention,

25 Figure 2 is a graph depicting results obtained from a dispenser such as shown in Figure 1,

Figure 3 is a cross-section of a steam valve, novel in itself, and which may be used in the water dispenser of the invention; and

30 Figure 4 is an exploded perspective view of the steam valve of Figure 3, as viewed from below.

Referring to Figure 1, the hot water dispenser comprises a main water reservoir 2 supplied from a cold water supply inlet 4. A baffle 6 divides the reservoir 2 from a smaller heating chamber 8. The latter is provided with an electrical heating element 10, a thermostat 12, and a hot water outlet 14 controlled by a tap or valve 16. A pumped outlet supply is optional. The baffle 6 is inclined obliquely relative to the horizontal plane and at a lower end has an orifice 18, and at an upper end has an orifice 20. Inclination is optional, but may assist water flow.

The heater operates as follows. The reservoir is filled with cold water, which passes through the orifices 18, 20 to also fill the heating chamber 8. The heating element 10 is switched on and, under the control of the thermostat 12 heats the water in the usual way. Because convection currents are constricted by the baffle 6, the body of water within the heating chamber 8 heats up faster than the water above the baffle, in reservoir 2. Given sufficient time, convection and conduction will cause the water in reservoir 2 to rise to the thermostatically controlled temperature, but it may be desirable to dispense a portion of hot water before this is achieved.

If at any time hot water is required, for example to prepare a beverage, hot water is taken through the water outlet 14 and is replaced by colder water flowing through orifices 18, 20 from reservoir 2. The heating chamber 8 tends to be supplied with water more through the lower orifice 18, since any steam or entrained air within chamber 8 tends to rise and escape through orifice 20 (note the dotted line adjacent orifice 20 to denote a small steam/air zone that may momentarily form in chamber 8).

Because the volume of water that is initially heated within chamber 8 is smaller than the volume held in reservoir 2, the water temperature in chamber 8 rapidly recovers to the thermostatically-desired temperature. This enables further hot water to be taken from the heater quicker than if the heating element was situated in reservoir 2 without the baffle. This is of considerable advantage when quantities of hot water are being consumed in small, discrete aliquots

such as in a beverage dispensing machine.

Figure 2 shows the results of using an apparatus according to Figure 1, with a reservoir 2 of approximately 1 litre capacity, and a heating chamber 8 capacity of approximately 200ml. Starting with the heater filled with water at ambient temperature, it will be seen that, once the heating element is switched on, the water within the chamber 8, below baffle 6, rises to about 95°C in about 80 seconds, whereas the water in the reservoir requires just under 400 seconds.

Referring now to Figures 3 and 4, the steam valve may be used in the dispenser of Figure 1, except that baffle 6 is replaced by a dome-shaped baffle 22, and vents 18,20 are replaced by steam valve 24.

The steam valve includes a housing 26 formed as a cup-shaped depression 28 in baffle 22. The cup-shaped depression has 3 wide cut-out slots 30 best seen in Figure 4. Also forming part of the valve is a vertically-moveable valve member 32.

The valve member 32 includes a silicon rubber sealing ring 34 which normally sits on a shoulder 36 formed by the rim of cup-shaped depression 28. Sealing ring 34 is fixed to the body of member 32, which body consists of a top plate 38 and six downwardly-depending splines 40. Three of the splines 40 have a cut-out 42, providing a shoulder 44, and a cut-out 46.

In use, the valve member 32 is inserted downwardly into the cup-shaped depression 28. The shoulders 44 of the splines 40 extending outwardly further than the radial distance of the depression 28, but can be flexed and depressed inwardly because of the presence of cut-outs 46. The shoulders thus "click" into depression 28. With the valve closed, the sealing ring 34 sits on shoulder 36, sealing reservoir 2 and chamber 8 from one another.

As steam is generated in chamber 8, the steam enters the inside of depression 28 through slots 30. The increase in pressure forces valve member 32 upwardly, lifting ring 34 off shoulder 36. This allows steam to escape into reservoir 2, which in turn heats the water therein. Whilst member 32 is in the lifted position, water can also run into the chamber 8 through the valve, in the

reverse direction to the steam, to replenish water in chamber 8.

The extent of upward movement of the member 32 is limited, as the shoulders 44 will come to rest against the lower surface 48 of the baffle 22 in the region of slots 30.

5        When the steam has escaped into reservoir 2 and the pressure between the latter and chamber 8 equalises, the member 32 drops back downwardly to return ring 34 onto shoulder 36, resealing reservoir 2 and chamber 8 from one another.

## Claims:-

1. A hot water dispenser having a water reservoir and a heating chamber divided therefrom, the reservoir having a cold water inlet port and the heating chamber having a hot water outlet port and being provided with means for heating water within the chamber, the reservoir and chamber being in fluid communication so that water and/or steam/gas can flow between them.

2. A dispenser according to claim 1 in which the chamber is below the reservoir and cold water flows from the reservoir to the chamber by gravity.

3. A dispenser according to claim 1 or 2 in which the chamber and reservoir are divided from one another by a baffle.

4. A dispenser according to claim 3 in which the baffle comprises a wall extending across and between vertical walls of a container.

5. A dispenser according to claim 4 in which the baffle is disposed obliquely relative to the horizontal plane and is provided with at least one orifice providing said fluid connection between the reservoir and chamber.

6. A dispenser according to claim 5 wherein the baffle is provided with an upper orifice and a lower orifice.

7. A valve comprising a housing having a cup-shaped depression and a valve member situated in the depression:

the depression being provided with one or more orifices; and

the valve member having a resilient sealing ring which rests, when the valve is closed, on a shoulder formed by the upper edge of the depression, and one or more downwardly-depending splines received in the depression, at least one spline having stop means to limit travel of the valve member vertically-upwardly when the valve is opened.

8. A valve according to claim 7 wherein the valve member has a top plate to which the sealing ring is attached and from which the one or more splines depend.

9. A valve according to claim 7 or 8 wherein the stop means comprises a shoulder on at least one spline, which shoulder contacts the lower surface of the

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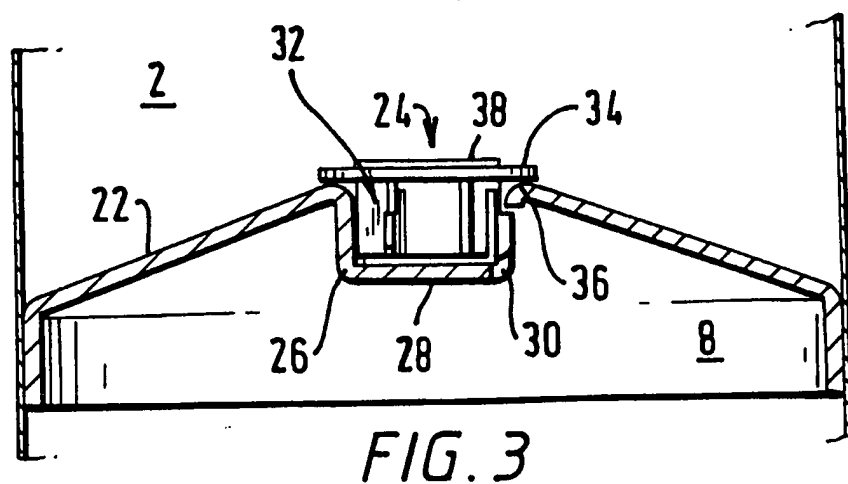
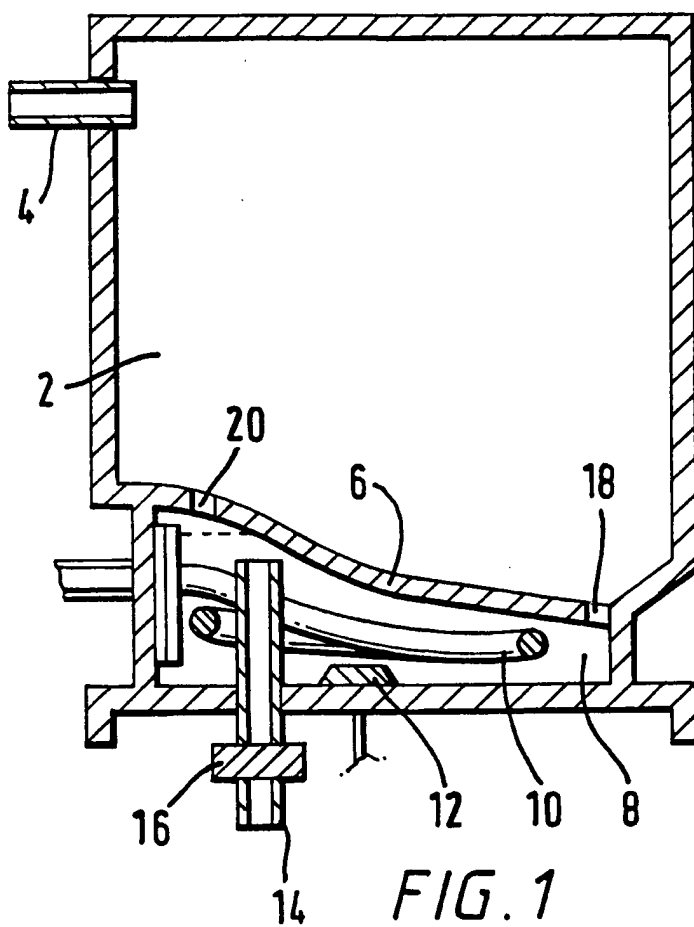
rim of the cup-shaped depression when the valve is open.

10. A hot water dispenser according to claim 4 wherein a valve as claimed in any of claims 7 to 9 is fitted within the baffle wall.

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2 / 3

FIG. 2

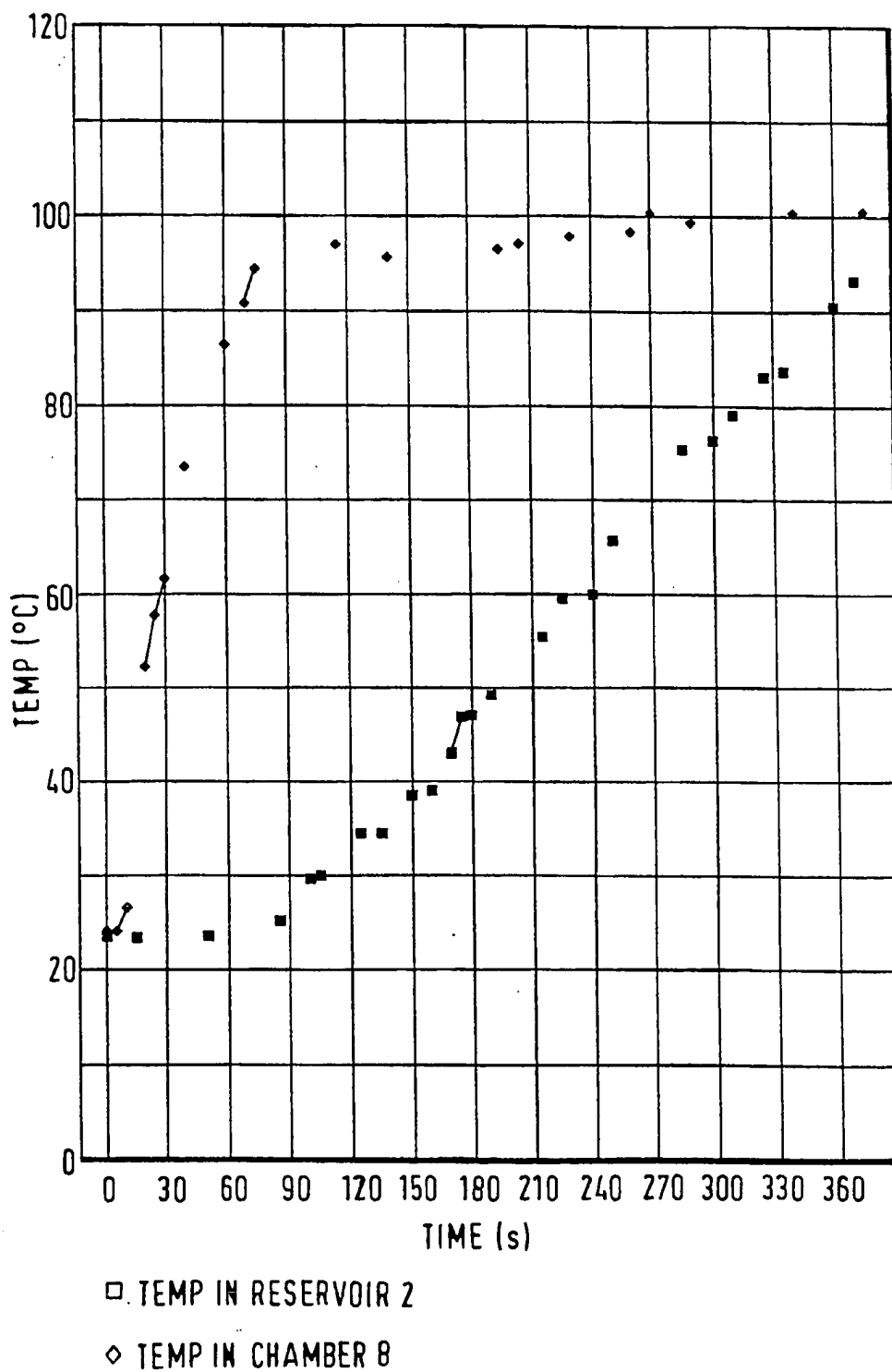
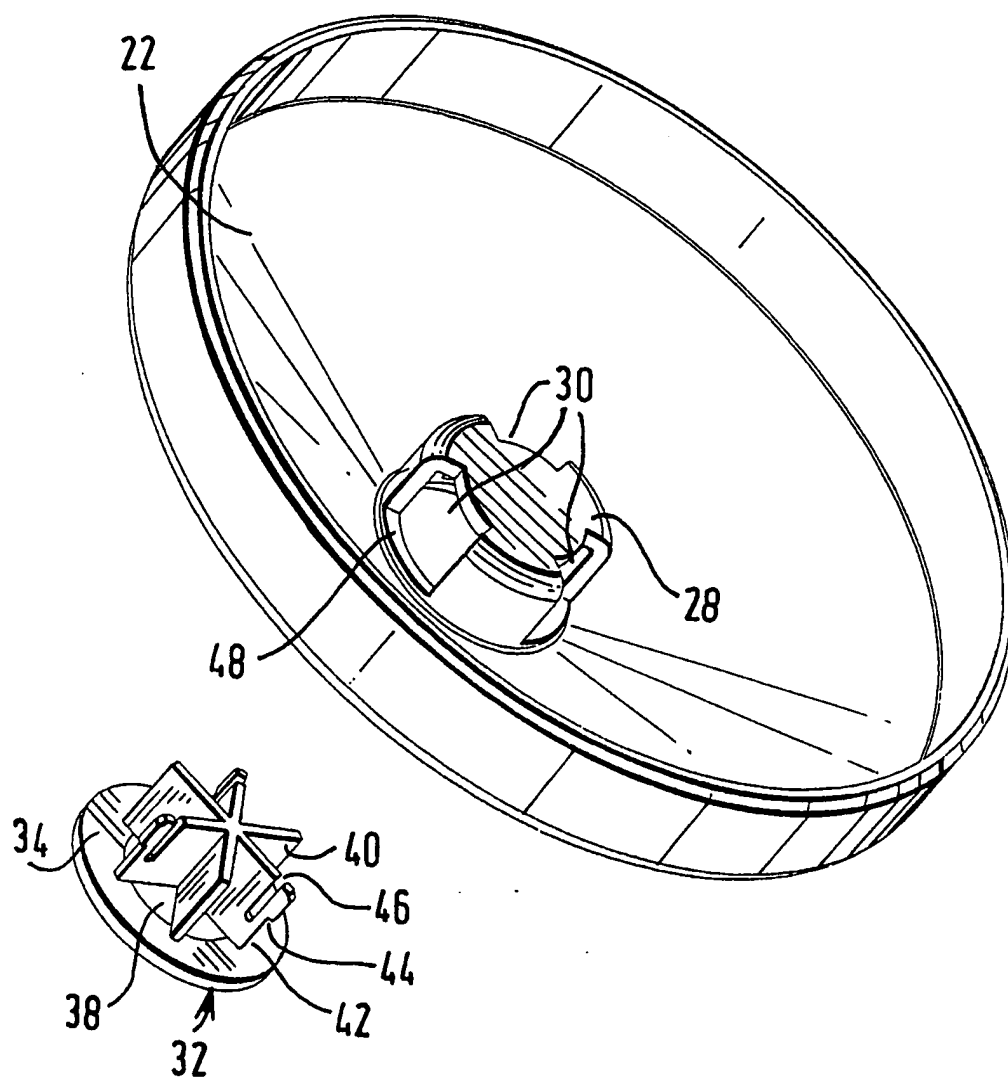


FIG. 4



# INTERNATIONAL SEARCH REPORT

Internal . Application No

PCT/GB 98/00122

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 6 A47J31/54 F16K15/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A47J F16K F24H F22B G07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 14 29 892 A (ELECTROSTAR GMBH) 21 November 1968 see page 2, paragraph 2 - page 5, paragraph 2; claims 1-3; figure ---	1-6
X	WO 93 18338 A (WITTENBORG A/S) 16 September 1993 see abstract; figure 2 ---	1-6
X	US 3 996 846 A (C.J. HUPF) 14 December 1976 see column 2, line 39 - column 3, line 6; figure 1 ---	1-4 7,8,10
X	US 2 926 234 A (R.A. PALMER) 23 February 1960 see column 1, line 65 - column 2, line 18; figures 1,3,5 ---	1-4 10
A	---	
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

17 April 1998

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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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# INTERNATIONAL SEARCH REPORT

International application No.  
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## Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:  
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:  
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## Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

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2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
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4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

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- ☐ The additional search fees were accompanied by the applicant's protest.
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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/GB 98/00122

1. Claims: 1-6, 10

Hot water dispenser

2. Claims: 7-9, 10

Valve

# INTERNATIONAL SEARCH REPORT

Information on patent family members

Internatl Application No

PCT/GB 98/00122

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